THE EFFECTIVENESS OF ACCURACY IN COST ESTIMATION BY USING MONTE CARLO SIMULATION MODEL

SITI HAIFULLIA BINTI AYOB

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Faculty of Technology
UNIVERSITI MALAYSIA PAHANG

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ABSTRACT

Estimation is a forecast tools which is predict the actual expenses of cost in a project should be. It is made to encourage the client on the progress of activity in each phase of the project that involves cost and also updating the client on the design of the project. This research is focused on time and cost management in a project. The variable that is controlled in this study is cost where as time is set as a fixed variable. Cost estimation in a project can be low, high or accurate. Alternatively, expenses that are involved in a project consist of direct cost and indirect cost. The objective that need to be achieved in this study are to identify factors affecting accurate cost estimation based on literature review studied and to suggest alternative method for cost estimation by using Monte Carlo simulation model. Besides, the problem statement that are discussed in this research are error in manual calculation of cost estimate, lack of experience in providing cost estimates from the new staff, difficulties to adjust the cost estimate for the changes in scope as the project develop and lastly providing estimates under pressure that are lead to inaccurate cost estimation. In order to provide accuracy for project budgeting, previous research has been studied to identify the current issues occurs in project management that are related to cost and time estimate and also the factors affecting accuracy of estimating. The literature review will discuss more on the overview of study of the effectiveness of accuracy cost estimating by using Monte Carlo simulation model. Existing technology and previous model on estimation of cost is discussing in this section. Besides, history of simulation system is also briefly explained. In methodology, the development of simulation process is discussed and the following method such as, company's report and other sources are used in this study to collect data. Validity and reliability of thus research is also discussed. For finding, the chapter will include the table, distribution graph, calculation and also formula that is used in order to gain the results. In summary, the implication of the study is also included in this chapter. Furthermore, the theoretical and practical implications are discussing in detail to make this research more useful for future user. Limitation of the study is stated in this section so that it will help the future user to know the barriers when conducting this research.

ABSTRAK

Anggaran adalah alat ramalan yang meramalkan perbelanjaan sebenar kos dalam sesebuah projek. Anggaran dibuat adalah untuk menggalakkan pelanggan mengatahui mengenai kemajuan aktiviti dalam setiap fasa projek yang melibatkan kos dan juga mengemas kini maklumat kepada pelanggan mengenai reka bentuk projek. Kajian ini memberi tumpuan kepada masa dan pengurusan kos dalam sesuatu projek. Pembolehubah yang dikawal dalam kajian ini adalah kos dan masa ditetapkan sebagai pembolehubah yang tetap. Anggaran kos dalam projek boleh menjadi rendah, tinggi atau tepat. Sebagai alternatif, perbelanjaan yang terlibat dalam projek terdiri daripada kos langsung dan kos tidak langsung. Objektif yang perlu dicapai dalam kajian ini adalah untuk mengenal pasti faktor-faktor yang memberi kesan kepada anggaran kos yang tepat berdasarkan kajian lepas yang diteliti dan mencadangkan kaedah alternatif untuk anggaran kos dengan menggunakan model simulasi Monte Carlo. Selain itu, pernyataan masalah yang dibincangkan dalam kajian ini adalah kesilapan dalam pengiraan manual anggaran kos, kekurangan pengalaman dalam menyediakan anggaran kos daripada kakitangan baru, kesukaran untuk menyesuaikan anggaran kos untuk perubahan dalam skop sebagai projek membangunkan dan akhir sekali menyediakan anggaran di bawah ketegangan yang membawa kepada anggaran kos yang tidak tepat. Dalam usaha untuk menyediakan ketepatan bagi belanjawan projek, penyelidikan sebelumnya telah dikaji untuk mengenal pasti isu-isu semasa berlaku dalam pengurusan projek yang berkaitan dengan kos dan anggaran masa dan juga faktor-faktor yang memberi kesan kepada ketepatan anggaran. Kajian yang lepas akan membincangkan mengenai gambaran keseluruhan kajian akan keberkesanan ketepatan pengiraan kos dengan menggunakan model simulasi Monte Carlo. Teknologi yang sedia ada dan model sebelumnya pada anggaran kos juga dibincangkan. Selain itu, sejarah sistem simulasi juga diterangkan secara ringkas. Dalam metodologi, proses simulasi dibincangkan dan kaedah berikut seperti , laporan syarikat dan sumber-sumber lain yang digunakan dalam kajian ini untuk mengumpul data. Kesahan dan kebolehpercayaan penyelidikan juga dibincangkan. Sebagai dapatan, jadual, graf, pengiraan dan juga formula yang digunakan untuk mendapat keputusan diterangkan. Ringkasnya , implikasi kajian ini juga termasuk dalam bab ini. Tambahan pula, implikasi teori dan praktikal dibincangkan secara terperinci untuk membuat kajian ini berguna untuk pengguna masa depan. Batasan kajian dinyatakan dalam seksyen ini supaya ia akan membantu pengguna masa depan untuk mengetahui halangan semasa menjalankan kajian ini.

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LIST OF ABBREVIATIONS

MCS	Monte Carlo Simulation
DBC	Deadline and Budget Constraint
3D	3 Dimensions
CAD	Computer Aided Design
COCOMO	Constructive Cost Model
SLOC	Source Lines of Code
PSO	Particle Swarm Optimization
CPO	Combination between Particle Swarm Optimization
PERT	Program Evaluation and Review Technique
CPM	Critical Path Method
RAND	Random

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Scheduling is an important methods to effectively organize the planning and cost management of a project. By implementing project scheduling, the allocation of resources, identification of tasks that needs to be completed, budgeting, critical path, and project constrained can be defined and monitored. A success of delivered project is determined by the time constraint, whether it is under budget and whether it fulfills a specific standard of quality requirement. Estimation of cost is a major issue during scheduling in project management. This research is focused on time and cost management in carrying out a project. The variable that is controlled in this study is the cost where as time is set as a fixed variable. Discussion on these variables will briefly done in chapter 4.

Cost estimation in a project can be low, high or accurate. Generally, accurate estimation can be underestimation and overestimation in a project cost. It is lead to the greater actual expenditures. Estimation of cost also depends on the quality of the history information (Enshassi, Mohamed and Abdel Hadi, 2013). The availability of historical data is affected the output that is generate in the simulation model. Estimation is a forecast tools which is predict the actual expenses of cost in a project should be. It is made to encourage the client on the progress of activity in each phase of the project that involves cost and also updating the client on the design of the project that consist of landscape, building model and etc. In order to prevent the unexpected situation occurs, it is necessary to provide the contingency plan to overcome the problems. The estimation cost will be restructuring so that the backup source of cost is provided. Alternatively, expenses that are involved in a project consist of direct cost and indirect cost.

The examples of direct cost are labor wages, equipments, overtime, sales taxes and materials. The direct cost will increase if the duration of the project is shortened and for indirect cost, the cost will be decreased if project period is delayed. Indirect cost consists of interest charges, insurances, contractual penalties, and clerical cost. Both costs are needed to be taken into consideration to reduce the expenses. In other studies, the researcher tried to ensure the project completion by minimizing the total project cost and penalty cost function (Hadi et al, 2011). In addition, based on the previous study, there are certain mathematical models that are used in order to cope with the cost estimation.

1.2 PROBLEM BACKGROUND

This study focuses on the problems that are occurs in accurate estimation. The problems occur are related to cost expenses in a project. In monitoring a project, an accurate estimation of cost is needed to enhance error in estimation and to achieve minimum total direct and minimum indirect cost so that the actual expenditure of a project can be predicted. The problems that can be lead to error estimation are failing to manage project uncertainties, providing estimates under pressure and dividing tasks with more than one resource. These problems that occur in estimate process will affected the output of estimated cost.

1.2.1 Problem Statement

Cost is the element that needs to be controlled in a project management planning. Cost is one of the elements that are included in triple constraint. Triple constraint consists of time, cost and quality need to be balanced in order to complete a project before deadline, within the budget and fulfill stakeholder requirements. According to Kerzner (2009), a successful project management can be determined by delivering project on time, within cost, assigning resources efficiently and is accepted by the customers. If one of the triple constraints is not managed properly, it will lead to the project failure, for example inaccurate estimating cost in a project. Cost estimation becomes an important issue and consideration in project management.

The problem that occurs in error of cost estimating is manual calculation that can cause inaccurate estimation of cost. Based on previous journal, Mohammad (2013) stated that the actual expenditure is influenced by the construction method, technology used and also construction techniques. This study shows that by using the alternative method which is Monte Carlo Simulation model in excel, it is also can estimate the cost for a project. Multiple times of generating the result will give an accurate cost for the project expenses. It is also can reduce the estimation error in calculation which is the uses of technology can increase the efficiency in calculating cost estimate. The influence of technology used in order to have accurate cost estimating is strengthen by the research has done by the Mohammad (2013). He shows that in his research, the influenced of construction method, technology used and construction techniques are effected the output of the calculation in a project. His research is based on the factor that can give accurate cost estimation in construction project. It is shows that the technique used in order to get the output is one of the important elements in cost estimate.

Besides, the level and expertise of the estimator is affected the accuracy of cost estimating. The problem to estimate cost usually occurs when the new estimator is given task to do the estimation. The accuracy of the estimation can be underestimated and actual values of project go wrong when the estimation is made. As recorded by Hanna (2007), lack of experience in providing cost estimates from the new staff lead to estimate error and underestimation in construction cost. By referring to the previous research, it is show that expertise and role of the estimator have a high impact in preparing estimation for a project. This study is conducted as the tools for the new staff in doing the estimation so that this research can help them in order to have a better method to do the cost estimation.

During conducted estimation, the estimators sometimes are having difficulties in managing the estimation. The difficulties happen when they need to adjust the cost estimate for the changes in scope as the project develop. The need to manage the uncertainties and predicted the backup cost for any damages occurs toward the problems. Because of failing to manage project uncertainties, the project may delayed and not be completed according to the deadline. The penalty to the developers will be given because of not following the agreement of the deal (Henyi Ji et al, 2009). Delayed time of a project will increase the cost expenses in order to cover up the damages. The uncertainties that may happen are bad weather that can

delay the progress of the project, changes that customers make to the requirement of the project, conflict between team members that distract the execution of the project, and lastly, the variation that exist in activity duration, cost and/or performance (Meyer et al, 2004). Based on the uncertainties problem, the estimation of cost will be inaccurate and over budget for a project.

Haughey (2008) stated that providing estimates under pressure influenced the inaccurate cost estimating. In estimation progress, when the estimator is under pressure, the emotional side can give effect on the estimation task. The calculation of cost estimation might false and give unreasonable outcome for a project. Ineffective calculation can be wrong when the person or the estimator is blamed on the fault in the meeting. The situation influences the estimator with tempered emotional toward delivered the task. Predicted cost of the project will be inaccurate even though the gathering data to complete the cost estimation is obtained from the historical data. The efficiency to calculate the estimation can be improved by using other method which the software is provided in generate the outcome of the estimation. The efficiency of the calculation can be highly improved because of the data running in the software is not influenced by the human emotional.

In this study, Monte Carlo simulation is used to get a precise result for costing in scheduling project planning. The function of this model is to estimate fast responses from the system in order to overcome the manual calculation that is time-consuming to get the specific answer. In this model, the output of the system can be controlled by the input that is inserted. The input is consists of minimum and maximum cost which is gained from historical information of the company. By controlling the input, the cost as the output can be determined as the exact result. Project managers also are able to have contingency planning when something happens to the project.

1.3 RESEARCH OBJECTIVE

This study will focus on method in improving the cost estimation of a project in order to decrease or maintained the cost of a project. The study will solve the problems according to the objective that are needed to be achieved. The objectives of the study are:

i) To identify factors affecting accurate cost estimation based on literature review studied.

ii) To suggest alternative method for cost estimation by using Monte Carlo simulation model.

1.4 RESEARCH QUESTION

Research question is developed to answer the questions that arise during the conduction of this study. It is a hypothesis where early assumptions are made to determine the problems. To achieve the objective, the questions need to be defined and verify to have a better solution for the problem statement. The research questions are as follows:

Research objective (1):

1.4.1 What are the factors affecting in accurate of estimation cost?

1.4.2 What are the variables that need to be fixed and control?

Research objective (2):

1.4.3 How to reduce estimation error in costing during conducting a project?

1.4.4 What is alternative method that can be used to generate the output?

1.5 SCOPE OF STUDY

In this study, the minimization of cost expenses for direct and indirect cost is focused by planning the budgeting in scheduling. The scope is focused on the population involving construction sites in Kuantan, Pahang. The simulation model is used as an approach for project managers to estimate the cost. It can be as an additional method to monitor their project. By using this simulation model, the probability to get the expecting cost and minimizing cost with exactly can be achieved.

1.6 SIGNIFICANCE OF STUDY

This study significantly identifies the method that is used in estimate the cost. Theoretically, it provides more detail to find solutions for the problems occur which are manual calculation that can cause inaccurate estimation of cost, lack of

experience in providing cost estimates from the new staff, changes in scope as the project develop, providing estimates under pressure and overlapping in dividing tasks of a project. In order to achieve the objective, Monte Carlo Simulation model in excel as the alternative method to reduce the problems. Further information by literature review can act as a reference to add knowledge and relate to the problem with the factors affecting accurate cost estimation. Compared to practically, the simulation model is to perform the solution for problem solving and at the same time to minimize the cost in scheduling.

1.7 OPERATIONAL DEFINITION

Many people apply a variety of model to have a better solution in order to solve the problem. In this study, simulation method is used to show the effectiveness of cost estimation by using Monte Carlo simulation method. This approach provides specific result and achieves the research objective at the same time. The information of the model will be explained more in chapter 3.

1.7.1 Simulation Model

Simulation model nowadays are widely used because computers are now able to perform many of simulation efficiently compared to before. Simulation is a very powerful and widely used management science technique for the analysis and the study of different types of system (Ibrahim, 2003). Accessibility of technology and science can provide approximate answer to the problem that is studied. It will generate a more effective, quicker result and a higher level of accuracy.

1.8 EXPECTED RESULT

Based on the study, the problems associated in cost estimation need to be optimum. Uncertainties, overlapping and clashing multi resources objectives become the problem in this study. Practically, by using the simulation model, it can provide an approximate estimation which has a higher level of accuracy and faster results. By using the technology, it can perform efficiently and minimize the error in calculating the expected result. This process involves random number and the probability to an approximation answer to the problem where the fixed amount of

duration which is a random number can be obtained from the collection of data. Information of the system will be discussed more in chapter 4.

1.9 THESIS ORGANISATION

The thesis is organized according to the format below and comprises of five chapters. The main objective of this thesis is to ensure the design method, analysis and interpretation of result can minimize the expenses in a project by using specific methods. Figure 1.1 shows the organization flow chart.

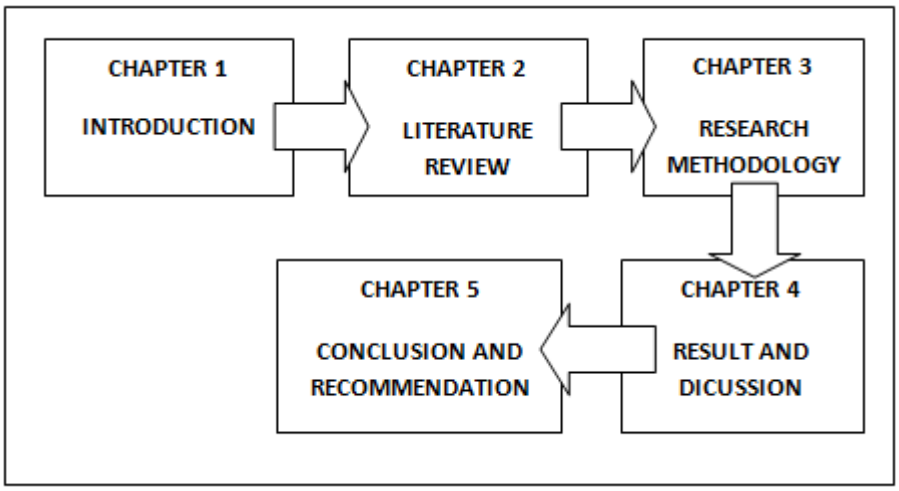

Figure 1.1: Thesis Organization

Chapter 1 explains the background of the study. It consists of the problem background/issues, problem statement, research objectives, research question, scope, significance of study, operational definition and expected results.

Chapter 2 describes previous research that has become a reference for this study. The overview of the study is also stated in this chapter. Term of scheduling and cost optimization is explained briefly in this chapter. The simulation model flow chart is shown as the progression of software to analyze the results.

Chapter 3 demonstrates the methods that are used in this study to collect the result. This chapter involves the procedure or formula to integrate the fast answer by using the simulation model.

Chapter 4 discusses the results obtained. In this chapter the results is analyzed by inserting the input to provide specific time estimation in scheduling. By estimating the duration, the minimization of direct and indirect cost expenses can be reduced.

Chapter 5 closes the study after the discussion of the results obtained. The recommendation is proposed in this thesis, as to serve as guide in the present time.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Cost estimating is a process of calculation where the estimating is mean to predict the cost by looking into the future costs of a project. Cost estimation is done before the work is carried out in a project. In project management, estimating is assuming that the cost of each activity is the function of resources allocated to it. The objective that is needed to be achieved in cost estimating is minimizing the cost under specified due date. In order to provide a solution for project budgeting, previous research has been studied to know the definition of estimation and accuracy. Besides, the purpose of cost estimating is also discussed in this section. Furthermore, factors that affecting accuracy cost in estimating and current issues occurs in project management are included. Total cost of project in this section is explained the cost expense that involves the amount of resources that are used during execution of the project. In this chapter, the literature review will discuss more on the overview of study of the effectiveness of accuracy cost estimating by using Monte Carlo simulation model. The overview has divided into two sub point. The first point is overview on study of time, accuracy cost estimating and simulation model. Existing technology and previous model on estimation of cost is discussing in this section. Besides, history of simulation system is also briefly explained. This chapter discusses on the specific point to have more info about budgeting. Case study of time and cost is also included as the source of reference and to strengthen this research.

2.2 DEFINITION OF ESTIMATING

Estimating in conducting a project is one of the elements of a successful project. It is most important function in financial management which is leads to assume the budgeting of a project. Estimating is a process of calculating and analyse all costs that involve in a project. The costs that are involved in particular task is included in total of cost estimating. In providing the real cost of prediction in realistic cost estimation, the estimators should have experience and skills in allocate the cost for each task in a milestone. Cost estimation is compulsory in any several of construction projects. The estimation is necessary in order to have a lower budget of a project which the project can be accomplished within time. Estimation is an assumption process which is involves the process of guessing calculation by viewing the data based on prediction in future work before the work is carried out. The estimator was responsible of the calculation in order to make sure that the financial outcome is successfully.

According to Mohammad (2011), estimation cost is a close forecast which the actual cost should be in the future. The researcher state the accuracy of the cost estimation is based on the method used in determine the differences between the actual costs with the forecast costs. In the other hand, Michael (2003) stated that cost estimate is verified the cost of a project either conceptually predicted or developed estimate is indeed actual cost. Therefore, the estimation is to manage project cost in responsive manner and precise. The estimation is expect to have an exact budgeting that is early prepared in a project which next the project will completed according to scope, high quality, meet all the performance requirements and under budgets.

Nick and Linda (2003) stated the differences definition of estimating. The researchers make a comparison between project budget and estimate cost. According to them, a project budget should not be confused with the cost estimate because the project budget will consists of total of cost estimate. It is known as soft cost which practically not include in cost estimation. For example, soft cost are include the moving cost, building permits, movable furniture and equipment, risk and fire insurance, fees and also land purchases.

Although the researchers have difference opinion related to the definition of estimating, they have similarities that estimating cost is involved with the assumption and prediction of future cost of a project. Subsequently, estimation cost is a process of calculating future cost in considering various cost alternatives. In addition, forecast cost is to reduce the cost at executing phase or lower the cost in allocation of resources that will be charged in a project.

2.3 DEFINITION OF ACCURACY

Accuracy of cost estimating is important in monitoring a project. To have an accurate estimating of cost, it is involved an effective financial management and a better understanding in budgeting and resource allocation. Accuracy can be describes in different ways which is the measurement outcome is close to the true value and also it is depend on the budgeting items included. Thus, the estimation of cost may different from the value that is used as the expected cost in project (Dysert, 2006). To measure the accuracy of the cost in a project, an expertise or estimator should have extensive experience in order to have accurate calculation in cost estimate. The accuracy of cost estimation will also affected direct and indirect factors. For example, the accuracy of cost estimation may influence by the organisation environment or the culture calculation of the organisation where the situation will give effect on the accuracy directly.

According to Oberlender and Trost (2003), the researcher had stated that the elements influence in cost estimating are the ways of estimation is providing, the person who was participate in preparing the estimation and also other factors that affected during preparing the cost budgeting. In construction industries, the cost estimating of a project is critical part in preliminary stage of forecast. The contractor, project team and expertise play important role at this stage. Various strategies are prepared at this stage so that if anything happen during the executing of a project, the problems could be overcome. Inaccuracies that may occur to the estimating will cause loss to the organisation, decrease in return on investment and also lost of opportunities to do estimation of a project in the future and loss of potential stakeholder. Furthermore, an estimator also will lose their job if the accuracy of the estimation is wrong and the organisational could short in source of monetary.

2.4 PURPOSE OF ESTIMATING

All the things that have been prepared in a project have their own purpose. Providing cost estimation also has purpose in a project. The task that have no preparation or specific purpose will cause the problems occurs. It is mean that the planning of work is not ready yet. To get better in estimating, the information and calculation or input data need to be define well in order to fulfil the scope of work. In this study, the researcher has identified a few purposes for doing the estimation based on previous studies. For example, the purpose of prepared estimation to ensure the cost of a project doesn't exceed the budgeting boundaries. According to Mohammad (2011), estimating is an indicator of possibility cost at the preliminary stage of construction which is provided to conduct the project cost and also the project budgeting. Besides, it is also as a tool technique that enable the outcome of the project cost is predicted effectively. The stakeholder can assess the estimation of a project as the cost is over budget or within budget.

Furthermore, doing the estimation can allow the related parties updating the allocation of resources, budgeting items and also the risk that may occurs in conducting a project. It is as a guideline to ensure that the detailed of budgeting is necessary and the monetary is sufficient for the task to be carried out. In addition, the estimation of cost will increase the performance of the project manager and increase the chance of the project success. Budgeting details is include the direct and indirect cost. Direct costs are labour wages, equipment, overtime, material, sales tax and materials while indirect costs are contract penalties, administrative cost and insurance. The estimation is aimed to forecast in the future where the create cost will be adequate within the duration of project completed.

Moreover, the estimation can be as a historical data for the new arrivals of estimators. Based on Skitmore (1990), the individuals or group of past, present and future can refer to the historical data as their reference. The new arrivals can determine the fitness of a project or even prepared the basis of controlling budget during monitoring a construction project. in summary, the purpose of the project essentially thought the people on how to do the estimating to have a successful planning. It is also to provide a precise estimating and reliable costing of a construction project. In order to do the estimation, estimators need to be known and

define the probability of influence factors that may affect during prepare the budgeting. The estimator also must careful because the simple mistake will bring huge impact to the organisational.

2.5 FACTORS THAT AFFECTING ACCURACY COST ESTIMATING

Cost management in construction field has been researched in previous studies. For example, the effectiveness of cost monitoring in project based on the management approach. The major objective for cost estimating is to minimize budgeting in scheduling, avoid extension time during critical path, deliver project before deadline and on time. By shortening the period of the project, many benefits can be obtained such as, covering up the early delay on early project planning, finishing the project before time, overcoming wastage in resources for the project, receiving bonus for early completion project and improving cash flow for the project. Among the factors that affect accuracy cost estimating are weather, availability of resources, market conditions, site constraints, and project complexity.

According to Dysert (2006), the writer state that many factors affected accuracy of cost estimation. For example, quality of the data, the level of project scope, techniques used in cost estimation, quality of the assumptions, effort in providing the estimation, the expertise and experience of the estimator and also market condition. Besides that, there are also other factors that influence the estimate which is the weather. It is indirectly related to estimate but the ability on controlling the project and the changes in estimation of scope progress. Besides that, the factors affected cost estimating are project team experience, detail of project design, availability of labour and materials and also quality of information (Odusami and Onukwube, 2008).

2.6 CURRENT ISSUES IN PROJECT MANAGEMENT

Issues in project management are familiar problems occurring in monitoring a project. Conflict always happen among project team because of the difference in opinions and different ideas on the solutions to overcome the problem. In estimating, cost and time are highly important issues on completing a project. In the construction field, the estimation time and cost can be determined as a process to establish the way to speed up project performance before project deliverable.

Among the problems encountered are budgeting problem, resource shortage, resource sharing and late start up project.

2.6.1 Budgeting Problem

According to Brad (2013), budgeting is a huge issue and critical to visibility. In triple constraint, cost is one part of it. Triple constraint needs to be balanced to achieve the objective. Cost has become a major aspect in conducting a project. In a project, costs are included in direct and indirect cost. To develop the budget, the cost factor in a project needs to be analysed, such as track of working hours and scope of the budget. Assigning cost should be clear and specific so that there will not be shortage in budgeting. The direct costs are labour wage, equipment, overtime, material, sales tax and materials compared with indirect cost consists of interest charge, insurance, contractual penalty, and clerical cost. The direct cost will increase if the duration of the project is shortened and for indirect cost, the cost will be decreased if the project period is delayed. Both costs are needed to be taken into consideration to reduce the expenses.

Resource Shortage

According to Adnan et al, (2009), the statistic of percentage average delay of a project is highly recorded. Percentage from contractor is 89.6% and the consultant is 94.3% where the reason for project delay is because of resource shortage. Resource allocation refers to resource-constraint in scheduling. The resource attempts to reschedule so that limited resources can be effectively managed to avoid the extension delayed time. This problem can affect the project performance and can become one of the obstacles. In the past, issues on assigning resources have been studied intensively in construction field to have a better solution.

2.6.2 Sharing Resources

According to Kelly (2011), the allocation of resources has always become a problem in conducting a project. He stated that to have a way in assigning own resources it will create conflict where conducting different project at the same time and dependencies of activity more or less the same has become difficulties. To maximize productivity, monitor other project timelines will cause frustration. Not

enough resources will also cause project delay. Here, the total cost will arise and lead to over budget. Direct cost will expense in a huge amount because of the resources that needs to be added to make sure the project is delivered before deadline.

2.6.3 Late Start Up The Project

Brian (2011) stated in his articles, in project management, project team will end all the activities at the end of the planning. Running out of time or cost will force the situation to do the work hastily. By rushing to complete a project, the team project will do low quality of work and basically will make errors in the progression of project. Project team will end up doing the work twice because at the end of time they need to make the improvement. In addition, the activities in scheduling will directly overlap. The entire task that needs to be done all at once is to complete the project faster. Too much task at a time will cause damage to the project because of too much responsibility for the project manager and other responsibilities are assigned to the others. Because of too much stress and hastiness in completion, several parts of the project do not have quality.

2.7 TOTAL COST OF A PROJECT

Total cost of project will depend on the approaches that are taken by financial management in conducting the project whether it is under budget or over budget. Financial management for a progress project is an important part. By supplying incentive to the budgeting of a project, it will act as an investment for short term that return profit must be increase. Financial problem in handling a project is between balancing the expenditure and return revenue. During the early planning period, the cash flow normally is highest compared to during the project on progress. Here, the financial planning must be completely considered such as the cost during construction progressing and facilities uses in a project.

The cost expense involves the amount of resources that are used during the execution of the project. Total cost of the project is includes direct cost and indirect cost. The direct costs are labor wages, equipment, overtime, material, sales tax and materials as seen in Figure 2.1.The figure shows the direct cost in graphically diagram.